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## CLAIMS

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(57) [Claim(s)]

[Claim 1]A lens barrel for cameras characterized by comprising the following.

A lens attachment component supported for an inside of a proposal that two insides of a proposal which held a moving lens and were mutually located in an abbreviated opposite hand on both sides of an optic axis of this moving lens were provided in an inside of a coat enabling free sliding.

An actuator which comprises a coil and a magnet which it has been mutually arranged on the same axle at a circumference of an axis of the above-mentioned optic axis, and were fixed to the above-mentioned lens attachment component and a member by the side of a coat according to each.

A position detecting means for being arranged at a position which is [ abbreviation regular intervals ] separated from two insides of a proposal in the above-mentioned coat, and detecting a position of a lens attachment component.

[Claim 2]The lens barrel for cameras according to claim 1 having arranged a speed detection means for detecting movement speed of a lens attachment component in a position of the above-mentioned position detecting means and an abbreviated opposite hand on both sides of an optic axis of a moving lens in the above-mentioned coat

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

The lens barrel for this invention cameras is explained in detail according to the following items.

A. Outline C. conventional technology of a Field of the Invention B. invention [Drawing 8]

D. Object of the Invention [Drawing 8]

E. The means F. example for solving a technical problem [Drawings 1 thru/or 7]

a. Outline [Drawing 1 and Drawing 2]

b. Support of a coat and a lens [Drawings 1 thru/or 3]

c. Supporting base [Drawings 1, 3, or 6]

d. Posterior-wall-of-stomach board [Drawing 1, Drawing 3, Drawing 4, and Drawing 6]

e. Lens attachment component [Drawing 1, Drawing 3, Drawing 4, and Drawing 6]

f. Actuator [Drawings 1, 3, or 6]

g. Detection means [Drawings 1, 3, or 6]

h. Modification of a position detecting means [Drawing 7]

### G. EFFECT OF THE INVENTION (A. Field of the Invention)

This invention relates to the new lens barrel for cameras. By being related with the lens barrel for cameras provided with the electromagnetic driving means for moving a moving lens, and the position detecting means which detects the position of a moving lens in detail, and devising the arranging mode of the above-mentioned driving means or a position detecting means, A coat can be made into shape without a small and partial lug, and when a moving lens is moved, it is going to provide the new lens barrel for cameras kept from giving the moment that the optic axis inclines to this.

### (B. Outline of an invention)

In the inside of two proposals mutually located in the abbreviated opposite hand on both sides of the optic axis of the moving lens concerned, the lens barrel for this invention cameras performs support of the lens attachment component holding a moving lens, and. By arranging a position detecting means to the position for which a driving means is constituted and which has arranged the same axle coil and magnet of each other to the circumference of the axis of the above-mentioned optic axis, and is [ abbreviation regular intervals ] separated from two insides of a proposal of the lens attachment

component in a coat, and doing in this way. When a moving lens is moved, it is made able to make the coat of a lens barrel into shape without a small and partial lug, and not to give the moment that the optic axis inclines to this.

(C. Conventional technology) [Drawing 8]

In the lens barrel of the camera provided with the automatic focusing function or the electric zoom function. The driving means for moving the moving lens for focusing and the moving lens for zooming to that optical axis direction is established, and comparatively many actuators of the electromagnetism drive type which has a coil and a magnet are used as this kind of a driving means. Drawing 8 shows an example a of the lens barrel provided with such an actuator. This lens barrel a is indicated to JP,1-196011,A.

In the figure, b is a coat of lens barrel a, carry out approximate circle tubed, and to the inside. It is arranged so that those optic axes of the necessary lens which the master lens c and others do not illustrate may correspond mutually, and the master lens c is held at the lens attaching part e which carried out the approximate circle tubed of the lens attachment component d.

f is an actuator for moving this lens attachment component d. g is the housing of the actuator f, it is located so that the most may project from the coat b to the side, and it is attached in the peripheral surface part of the coat b so that the building envelope may follow the building envelope of the coat b. h is a sliding shaft, and the both ends are supported by the bearings i and i fixed to the housing g order both ends, enabling free sliding so that it may extend in accordance with a direction parallel to the optic axis of the master lens c. j is a yoke which consists of the disk part k which succeeds in the front end part, and the body l projected toward back from the periphery edge, the magnet m which made approximately ring shape the rear face of the disk part k -- the body l -- the same axle -- it is attached like and the disk part k is being fixed to the housing g in the state where it was located so that these magnets m and the body l might surround the portion of front end slippage of the sliding shaft h. It has the coil binding part p which n is a coil bobbin and carried out same axle boss section o and cylindrical shape mutually. The coil q is looped around the peripheral face of the coil binding part p, boss section o is being fixed to the sliding shaft h in the shape of outside attachment, and the coil q is located in the place corresponding between the body l of the yoke j, and the magnet m. And the connecting part r projected from the lens attaching part e is fixed to the back of the coil bobbin n, and said lens attachment component d is supported by the guiding shaft t by which the arm s was fixed to the coat b, enabling free sliding.

Since the locomotive faculty to the direction according to the direction of driving current will be energized by this coil q if a deer is carried out and driving current is supplied to the coil q, the coil bobbin n, the sliding shaft h, and the lens \*\*\*\*\* agent d are moved to the front or back in one, and, thereby, the master lens c is moved.

(D. Object of the Invention) [Drawing 8]

Since it is located so that the actuator f for moving the master lens c may project from the peripheral surface of the coat b to the side if it is in such lens barrel a, the outside of a lens barrel, Since it becomes the shape which has a lug selectively and this is moreover laminated on covering of a wrap

sake by the actuator f, The lug becomes large unexpectedly and the size of the lens system of lens barrel a which can be set radially has after all the problem of being a quite large size considering the size of the maximum diameter of the lens system concerned.

Such a lug of lens barrel a also becomes a cause which worsens user-friendliness of making hard to do operation to various kinds of operating members which give holding of the camera concerned, and it is difficultly sufficient for, or are arranged at the peripheral surface part of a lens barrel, etc. and a camera.

Since the locomotive faculty produced in the coil q is applied to the portion projected to the 1 side from the connecting part r e of the lens attachment component d, i.e., the lens attaching part holding moving lens c, When the lens attachment component d is moved, a moment arises in this, and there is a problem that a motion of the lens attachment component d becomes heavy, or the optic axis of moving lens c inclines with this moment.

(E. The means for solving a technical problem)

Then, in order that the lens barrel for this invention cameras may solve an aforementioned problem, It is made to support inside two proposals in which two insides of a proposal mutually located in the abbreviated opposite hand on both sides of the optic axis of the moving lens of the lens attachment component holding a moving lens were provided inside the coat, enabling free sliding, The coil and magnet which constitute an actuator are fixed to a lens attachment component and the member by the side of a coat according to each so that it may be mutually arranged on the same axle at the circumference of the axis of the above-mentioned optic axis, The position detecting means for detecting the position of a lens attachment component from two insides of a proposal in the above-mentioned coat to the position as for which abbreviation regular intervals separated is established. Therefore, if it is in the lens barrel for this invention cameras, The moving lens of the space for arranging a moving lens and the actuator to which it is moved will set radially, and the size of a large grade will be [ \*\* and the surroundings ] sufficient for a required size from the diameter of the moving lens concerned, And since it distributes moderate and two insides of a proposal and position detecting means are arranged at the circumference of the axis of the optic axis of a moving lens, By these, can make quite small the size which can set the moving lens of a lens barrel radially, and. Even if there is an outside which does not have a partial lug, or such a lug, it can make it a small outside and is excellent in the design effect, And can consider it as user-friendly shape and further, Since the locomotive faculty produced to the coil or magnet which is a move element of an actuator will be uniformly applied to the whole portion located so that a moving lens might be annularly surrounded among lens attachment components, When a lens attachment component is moved, the moment that the optic axis inclines to this cannot arise, therefore a lens attachment component can be smoothly moved along the optical axis direction of a moving lens.

(F. Example) [Drawings 1 thru/or 7]

Below, it explains according to the example illustrating the details of the lens barrel for this invention cameras.

The illustrated example applies this invention to the lens barrel of a video camera.

(a. Outline) [Drawing 1, Drawing 2]

As for 1, the body part and 3 are lens barrels a video camera and 2, and this lens barrel 3 equips a cross direction with the coat 4 for which it has a long outside of an approximately prismatic form, and it is provided so that it may project toward the front from the front end surface of the body part 2. And inside the coat 4, the lenses 5a, 5b, 5c, 6a, 6b, 6c, 7a, 7b, 8a, 8b, 9, 10a, 10b, and 10c of a large number which have a predetermined optical control operation, respectively share one optic-axis x-x mutually, and are arranged in this order from before.

A zoom lens system is constituted by the lenses 5a, 5b, 5c, 6a, 6b, 6c, 7a, and 7b, the focus lens system is constituted by the lenses 8a, 8b, 9, 10a, 10b, and 10c of the complementary, and the lenses 6a, 6b, and 6c are the moving lenses for zooming.

The lens group 11 which comprises the three lenses 10a, 10b, and 10c by the side of the back end is what is called a master lens, This master lens 11 is a moving lens for focusing, and this master lens 11 is held at the lens attachment component 12 supported by the coat 4 enabling free movement to a cross direction, and. It is moved to a cross direction by the actuator 15 provided with the coil 13 and the magnet 14.

16 is a diaphragm blade.

Although the graphic display is omitted, the recording device etc. which change into an electrical machinery signal the optical image which the cassette mount and the tape running mechanism which the inside of the body part 2 is equipped with a tape cassette enabling free attachment and detachment, and said lens system caught, and carry out magnetic recording of it to the magnetic tape of a tape cassette are established.

(b. Support of a coat and a lens) [Drawings 1 thru/or 3]

As described above, the coat 4 of the lens barrel 3 has an outside of an approximately prismatic form, and the space 17 which carried out the opening to coat 4 order both sides is formed in the inside.

The sectional shape which intersects perpendicularly with optic-axis x-x this space 17 to the fixed lens cylinder 18 which succeeded in the shape of an approximately square and has been arranged in the shape of inner fitting in the front end part The lens 5a, To two fixed lens cylinders which 5b and 5c were held and have been arranged in the pars intermedia and which are not illustrated, the lens 7a, 7b and the lenses 8a and 8b are held according to each, and it is held in the front side [ which is supported like and mentions the lens 9 later further ] supporting base which the moving lenses 6a, 6b, and 6c for zooming can move to the guiding shaft which was fixed to the coat 4, and which is not illustrated freely to a cross direction.

(c. Supporting base) [Drawings 1, 3, or 6]

19 is a supporting base for supporting said lens attachment component 12, the actuator 15, various kinds of detection means to mention later, etc.

Project from the base 20 which carried out tabular [ of the approximately square ], and its rear face, the two same axle ringed walls 21 and 22, the two bearing parts 23 and 23, and the one detection member fitting part 24 of each other are formed in one with a synthetic resin, and the supporting base

19 changes, The inside ringed wall 21 is formed so that it may project toward back from the center section of the base 20, and the hole 21a is the light passing hole in which the front end carried out the opening to the front face of the base 20.

The lens 9 is arranged in this light passing hole 21a.

the diameter of the outside ringed wall 22 -- a length of one side of the base 20 -- \*\* -- it being small and, The two bearing parts 23 and 23 and detection member fitting parts 24 make tubed [ long ] a cross direction, respectively, Two corners where the bearing parts 23 and 23 were mutually located in the opposite hand across the light passing hole 21a among four corners of the base 20, Namely, it is formed so that it may see from the front and may project toward back from two corners, the upper right and the lower left, The detection member fitting part 24 is formed so that it may project toward back from an upper left corner, and the opening of the front end of the holes 23a and 23a of these bearing parts 23 and 23 and the hole 24a of the detection member fitting part 24 is carried out to the front face of the base 20.

25, 25, and ... are the bearing metal which carried out cylindrical shape, and press fit immobilization of these bearing metal 25 and 25 and --- is carried out to the holea [ 23 ] and 23a order both ends of the bearing parts 23 and 23.

22a is the attaching recess formed in the position of the detection member fitting part 24 and the abbreviated contrary on both sides of the axis of the light passing hole 21a among the peripheral faces of the ringed wall 22.

26 is an intermediate wall (refer to the 1st figure) of the coat 4. It is located so that this intermediate wall 26 may be in the position of approximately middle in the cross direction of the coat 4 and space 17 may be made into order for abbreviated 2 minutes, and the base 20 of the supporting base 19 is being fixed to the rear face of this intermediate wall 26 by fixing means, such as a screw clamp, for example.

26a is the light passing hole formed in the approximately center part of the intermediate wall 26. 26b and 26b are the holes formed so that it might be open for free passage to the holes 23a and 23a of the bearing parts 23 and 23 on the rear face of the intermediate wall 26.

(d. Posterior-wall-of-stomach board) [Drawing 1, Drawing 3, Drawing 4, Drawing 6]

27 is a posterior-wall-of-stomach board -- the base 20 of the supporting base 19 -- abbreviated -- it is formed so that it may succeed in tabular [ of the square which has the same size ], and the light passing hole 27a is formed in the center section.

And such a posterior-wall-of-stomach board 27 is arranged in the state with a predetermined interval between the supporting bases 19 at the rear end part of the space 17, and it is fixed by the fixing means which is not illustrated to the coat 4.

(e. Lens attachment component) [Drawing 1, Drawing 3, Drawing 4, Drawing 6]

The principal piece 28 to which, as for the lens attachment component 12, the surroundings made tabular [ of the small approximately square ] abbreviated \*\* from the posterior-wall-of-stomach board 27, It projects from the front face of this principal piece 28, and same axle lens attaching part 29 and

coil bobbin 30, the two mounting bosses 31 and 31, and the two detection member fitting parts 32 and 33 of each other that also projected this from the front face of the principal piece 28 are formed in one with the synthetic resin.

The lens attaching part 29 and the coil bobbin 30 are carrying out approximate circle tubed with short shaft-orientations length considering the size of a diameter, respectively, The lens attaching part 29 is formed so that it may project toward the front from the center section of the principal piece 28, the hole 29a is the light passing hole in which the rear face carried out the opening to the rear face of the principal piece 28, and the master lens 11 is held at such a lens attaching part 29.

And the mounting bosses 31 and 31 are arranged according to each in the corner at the upper right of the principal piece 28, and a lower left corner, and the rear end part of the sliding shafts 34 and 34 is being fixed in the shape of burial. Therefore, the driving shafts 34 and 34 are projected in parallel toward the front from the corner of the lens attachment component 12 mutually located in an opposite hand. And such sliding shafts 34 and 34 are inserted in the bearing metal 25 and 25 supported by the bearing parts 23 and 23 of said supporting base 19, the holes 25a and 25a of ..., and ..., enabling free sliding.

carrying out a deer -- the lens attachment component 12 -- the supporting base 19 and the posterior-wall-of-stomach board 27 -- it can do and can move in the direction parallel to optic-axis x-x freely -- it is supported like.

The two detection member fitting parts 32 and 33 are arranged according to each in two corners the lower right and at the upper left of the principal piece 28.

(f. Actuator) [Drawings 1, 3, or 6]

Said actuator 15 comprises the magnet 14 supported by the yoke body 35 supported by the supporting base 19 and this yoke body 35 and the coil 13 supported by the lens attachment component 12.

The inner yoke 35b which carried out cylindrical shape projected towards back from the inner periphery edge of the middle yoke 35a which carried out approximately ring shape, and this middle yoke 35a, and the outer yoke 35c projected towards back from the outer periphery part of the middle yoke 35a the yoke body 35 with the good metallic material of permeability. It is formed in one, and changes and the abbreviated first portion is being fixed to the base 20 in the state where it was located between the two ringed walls 21 and 22 of the supporting base 19.

The magnet 14 is formed so that it may succeed in short cylindrical shape to shaft orientations, and it is magnetized so that magnetic poles may differ towards intersecting perpendicularly with the axis, and it is being fixed to the outer yoke 35c in the shape of inner fitting.

And the coil 13 is wound around the first portion of the peripheral face of the coil bobbin 30 of the lens attachment component 12, and is located in the state with \*\*\*\*\* to these between the inner yoke 35b and the magnet 14.

The closed magnetic circuit which carries out a deer and along which the magnetic flux which came out of the magnet 14 passes by the magnet 14 and the yoke body 35, That is, the closed magnetic

circuit along which the above-mentioned magnetic flux passes by the course of the magnet 14-outer yoke 35c-middle yoke 35a-inner yoke 35b-magnet 14, for example is formed, and the coil 13 is located on such a closed magnetic circuit.

Therefore, since the magnetic flux from the coil 13 to the direction according to the direction of that driving current will occur if driving current is supplied to the coil 13, thereby, the locomotive faculty to the front or back is energized by the coil 13, and the lens attachment component 12 is moved in one with the master lens 11 by this locomotive faculty.

(g. Detection means) [Drawings 1, 3, or 6]

36 is a position of the lens attachment component 12, and a position detecting means for detecting the position of the master lens 11, if it puts in another way, and this position detecting means 36 comprises the inclination magnet attached in the lens attachment component 12, and the Hall device attached in the supporting base 19. Namely, 37 is an inclination magnet with which the sectional shape which intersects perpendicularly with a longitudinal direction succeeds in a rectangle, The rear end part is supported by \*\*\*\*\* at the detection member fitting part 32 of the lower right established in the lens attachment component 12, and the first portion 37a of - side which turns to the optic-axis x-x side inclines so that it may become far from optic-axis x-x, as it goes to the front end. 38 is a linear type Hall device, it is attached in said attaching recess 22a formed in the ringed wall 22 of the supporting base 19, and the above-mentioned inclined plane 37a of the inclination magnet 37 counters this Hall device 38. Therefore, since the interval between the inclination magnet 37 and Hall device 38 will change and the density which attains to Hall device 38 of the magnetic flux which has come out of the inclination magnet 37 will change if the lens attachment component 12 moves, The voltage of the value according to the magnetic flux density at that time is outputted, and the position of the lens attachment component 12 is detected from Hall device 38 by detecting the voltage.

In order that 39 may control the movement speed of the lens attachment component 12, it is a speed detection means which detects this speed, and this speed detection means 39 comprises the move magnet formed in the lens attachment component 12, and the sensing coil provided in the supporting base 19. That is, 40 is the move magnet which carried out the shape of an approximate circle pillar, it is magnetized so that magnetic poles may differ by the longitudinal direction, and the end part is supported by the detection member fitting part 33 at the upper left of the lens attachment component 12. 41 is a sensing coil, it is attached in the hole 24a of the detection member fitting part 24 of the supporting base 19 in the shape of inner fitting, and the front end part of the move magnet 40 is located inside this sensing coil 41. Therefore, since the move magnet 40 will move in one with it if the lens attachment component 12 moves, the current of the value according to the speed of that movement flows into the sensing coil 41, and the movement speed of the lens attachment component 12 is detected by detecting the value of this current.

When the lens attachment component 12 is moved and the master lens 11 approaches a focusing position, it is controlled so that the movement speed of the lens attachment component 12 becomes slow, and hunching is kept from arising by it at the time of focusing.

(h. Modification of a position detecting means) [Drawing 7]

The modification 36A of the above-mentioned position detecting means 36 is shown in Drawing 7. This position detecting means 36A uses the mutual magnetization type move magnet 42 instead of said inclination magnet 37. That is, this move magnet 42 is magnetized so that magnetic poles may differ by turns along with that longitudinal direction. The magneto resistance effect element (henceforth an "MR sensor") 43 is attached in the attaching recess 22a of the ringed wall 22 of the supporting base 19 instead of said Hall device 38. Therefore, since the resistance which the magnetic flux density which attains to MR sensor 43 changes, and MR sensor 43 shows will change if the move magnet 42 moves with movement of the lens attachment component 12, the present position of the lens attachment component 12 is detectable by counting this change.

A potentiometer may be placed as a position sensing device.

(G. Effect of the invention)

So that clearly from the place indicated above the lens barrel for this invention cameras, The lens attachment component supported for the inside of the proposal that two insides of a proposal which held the moving lens and were mutually located in the abbreviated opposite hand on both sides of the optic axis of this moving lens were provided in the inside of a coat enabling free sliding, The actuator which it is mutually arranged on the same axle at the circumference of the axis of the above-mentioned optic axis, and comprises the coil and magnet which were fixed to the above-mentioned lens attachment component and the member by the side of a coat according to each, It had the position detecting means for being arranged at the position which is [ abbreviation regular intervals ] separated from two insides of a proposal in the above-mentioned coat, and detecting the position of a lens attachment component.

Therefore, if it is in the lens barrel for this invention cameras, The moving lens of the space for arranging a moving lens and the actuator to which it is moved will set radially, and the size of a large grade will be [ \*\* and the surroundings ] sufficient for a required size from the diameter of the moving lens concerned, And since it distributes moderate and two inside of a proposal and a proposal and a position detecting means are arranged at the circumference of the axis of the optic axis of a moving lens, By these, can make quite small the size which can set the moving lens of a lens barrel radially, and. Even if there is an outside which does not have a partial lug, or such a lug, it can make it a small outside and is excellent in the design effect, And can consider it as user-friendly shape and further, Since the locomotive faculty produced to the coil or magnet which is a move element of an actuator will be uniformly applied to the whole portion located so that a moving lens might be annularly surrounded among lens attachment components, When a lens attachment component is moved, the moment that the optic axis inclines to this cannot arise, therefore a lens attachment component can be smoothly moved along the optical axis direction of a moving lens.

In the invention of claim 2, the speed detection means for detecting the movement speed of a moving lens was arranged to the prescribed position of a position detecting means and an abbreviated opposite hand on both sides of the optic axis of the moving lens in a coat.

Therefore, it will be arranged so that two inside of a proposal and a proposal, a position detecting means, and a speed detection means may occupy four square corners according to each to the

circumference of the axis of the optic axis of a moving lens.  
therefore, the diameter of a moving lens -- \*\* and a surroundings grade -- since the cylindrical space which has a diameter of large length, and one side can arrange a necessary member by high density in rectangular pipe-like Hitoshi Sorama who has a rectangular cross section of the above-mentioned length, an outside can be miniaturized further, maintaining a necessary function.

In said example, although the sliding shaft was fixed to the lens attachment component and the bearing part in which this sliding shaft was provided at the coat side was made to support enabling free sliding, the guiding shaft is fixed to the coat side and a lens attachment component may be made to be supported by this guiding shaft, enabling free sliding.

Although this sensor was arranged in said example on the outside of the yoke arranged so that the outer yoke, i.e., the coil, and magnet of an actuator may be surrounded, using a magnetic sensor as a position detecting means, Since it can prevent being influenced by the magnetic flux which the sensor concerned generates in an actuator by doing in this way, a detecting position with high accuracy into which a noise does not go can be performed.

In addition, the shape of each part shown in the drawing, physical relationship or the kind of camera used, the kind of moving lens, etc. are only what showed a mere example which hits carrying out this invention, and the technical scope of this invention is restrictively interpreted with these shape, and, of course, there is nothing.

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## TECHNICAL FIELD

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### (A. Field of the Invention)

This invention relates to the new lens barrel for cameras. By being related with the lens barrel for cameras provided with the electromagnetic driving means for moving a moving lens, and the position detecting means which detects the position of a moving lens in detail, and devising the arranging mode of the above-mentioned driving means or a position detecting means, A coat can be made into shape without a small and partial lug, and when a moving lens is moved, it is going to provide the new lens barrel for cameras kept from giving the moment that the optic axis inclines to this.

### (B. Outline of an invention)

In the inside of two proposals mutually located in the abbreviated opposite hand on both sides of the optic axis of the moving lens concerned, the lens barrel for this invention cameras performs support of the lens attachment component holding a moving lens, and. By arranging a position detecting means to the position for which a driving means is constituted and which has arranged the same axle coil and magnet of each other to the circumference of the axis of the above-mentioned optic axis, and is [ abbreviation regular intervals ] separated from two insides of a proposal of the lens attachment component in a coat, and doing in this way. When a moving lens is moved, it is made able to make the coat of a lens barrel into shape without a small and partial lug, and not to give the moment that the optic axis inclines to this.

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## PRIOR ART

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### (C. Conventional technology) [Drawing 8]

In the lens barrel of the camera provided with the automatic focusing function or the electric zoom function. The driving means for moving the moving lens for focusing and the moving lens for zooming to that optical axis direction is established, and comparatively many actuators of the electromagnetism drive type which has a coil and a magnet are used as this kind of a driving means. Drawing 8 shows an example a of the lens barrel provided with such an actuator. This lens barrel a is indicated to JP,1-196011,A.

In the figure, b is a coat of lens barrel a, carry out approximate circle tubed, and to the inside. It is arranged so that those optic axes of the necessary lens which the master lens c and others do not illustrate may correspond mutually, and the master lens c is held at the lens attaching part e which carried out the approximate circle tubed of the lens attachment component d.

f is an actuator for moving this lens attachment component d. g is the housing of the actuator f, it is located so that the most may project from the coat b to the side, and it is attached in the peripheral surface part of the coat b so that the building envelope may follow the building envelope of the coat b. h is a sliding shaft, and the both ends are supported by the bearings i and i fixed to the housing g order both ends, enabling free sliding so that it may extend in accordance with a direction parallel to the optic axis of the master lens c. j is a yoke which consists of the disk part k which succeeds in the front end part, and the body l projected toward back from the periphery edge, the magnet m which made approximately ring shape the rear face of the disk part k -- the body l -- the same axle -- it is attached like and the disk part k is being fixed to the housing g in the state where it was located so that these magnets m and the body l might surround the portion of front end slippage of the sliding shaft h. It has the coil binding part p which n is a coil bobbin and carried out same axle boss section o and cylindrical shape mutually, The coil q is looped around the peripheral face of the coil binding part p, boss section o is being fixed to the sliding shaft h in the shape of outside attachment, and the coil q is located in the place corresponding between the body l of the yoke j, and the magnet m. And the connecting part r projected from the lens attaching part e is fixed to the back of the coil bobbin n, and said lens attachment component d is supported by the guiding shaft t by which the arm s was fixed to

the coat b, enabling free sliding.

Since a locomotive faculty to a direction according to the direction of driving current will be energized by this coil q if a deer is carried out and driving current is supplied to the coil q, the coil bobbin n, the sliding shaft h, and the lens \*\*\*\*\* agent d are moved to the front or back in one, and, thereby, the master lens c is moved.

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## EFFECT OF THE INVENTION

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### (G. An effect of the invention)

So that clearly from a place indicated above a lens barrel for this invention cameras, A lens attachment component supported for an inside of a proposal that two insides of a proposal which held a moving lens and were mutually located in an abbreviated opposite hand on both sides of an optic axis of this moving lens were provided in an inside of a coat enabling free sliding, An actuator which it is mutually arranged on the same axle at a circumference of an axis of the above-mentioned optic axis, and comprises a coil and a magnet which were fixed to the above-mentioned lens attachment component and a member by the side of a coat according to each, It had a position detecting means for being arranged at a position which is [ abbreviation regular intervals ] separated from two insides of a proposal in the above-mentioned coat, and detecting a position of a lens attachment component. Therefore, if it is in a lens barrel for this invention cameras, A moving lens of space for arranging a moving lens and an actuator to which it is moved will set radially, and a size of a large grade will be [ \*\* and the surroundings ] sufficient for a required size from a diameter of the moving lens concerned, And since it distributes moderate and two inside of a proposal and a proposal and a position detecting means are arranged at a circumference of an axis of an optic axis of a moving lens, By these, can make quite small a size which can set a moving lens of a lens barrel radially, and. Even if there is an outside which does not have a partial lug, or such a lug, it can make it a small outside and is excellent in the design effect, And can consider it as user-friendly shape and further, Since a locomotive faculty produced to a coil or a magnet which is a move element of an actuator will be uniformly applied to the whole portion located so that a moving lens might be annularly surrounded among lens attachment components, When a lens attachment component is moved, a moment that the optic axis inclines to this cannot arise, therefore a lens attachment component can be smoothly moved along an optical axis direction of a moving lens.

In the invention of claim 2, the speed detection means for detecting the movement speed of a moving lens was arranged to the prescribed position of a position detecting means and an abbreviated opposite hand on both sides of the optic axis of the moving lens in a coat.

Therefore, it will be arranged so that two inside of a proposal and a proposal, a position detecting

means, and a speed detection means may occupy four square corners according to each to the circumference of the axis of the optic axis of a moving lens.

therefore, the diameter of a moving lens -- \*\* and a surroundings grade -- since the cylindrical space which has a diameter of large length, and one side can arrange a necessary member by high density in rectangular pipe-like Hitoshi Sorama who has a rectangular cross section of the above-mentioned length, an outside can be miniaturized further, maintaining a necessary function.

In said example, although the sliding shaft was fixed to the lens attachment component and the bearing part in which this sliding shaft was provided at the coat side was made to support enabling free sliding, the guiding shaft is fixed to the coat side and a lens attachment component may be made to be supported by this guiding shaft, enabling free sliding.

Although this sensor was arranged in said example on the outside of the yoke arranged so that the outer yoke, i.e., the coil, and magnet of an actuator may be surrounded, using a magnetic sensor as a position detecting means, Since it can prevent being influenced by the magnetic flux which the sensor concerned generates in an actuator by doing in this way, a detecting position with high accuracy into which a noise does not go can be performed.

In addition, the shape of each part shown in the drawing, physical relationship or the kind of camera used, the kind of moving lens, etc. are only what showed a mere example which hits carrying out this invention, and the technical scope of this invention is restrictively interpreted with these shape, and, of course, there is nothing.

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[Translation done.]

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## TECHNICAL PROBLEM

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### (D. Object of the Invention) [Drawing 8]

Since it is located so that the actuator f for moving the master lens c may project from a peripheral surface of the coat b to the side if it is in such lens barrel a, an outside of a lens barrel, Since it becomes the shape which has a lug selectively and this is moreover laminated on covering of a wrap sake by the actuator f, The lug becomes large unexpectedly and a size of the lens system of lens barrel a which can be set radially has after all the problem of being a quite large size considering a size of a maximum diameter of the lens system concerned.

Such a lug of lens barrel a also becomes a cause which worsens user-friendliness of making hard to do operation to various kinds of operating members which give holding of the camera concerned, and it is difficultly sufficient for, or are arranged at a peripheral surface part of a lens barrel, etc. and a camera.

Since a locomotive faculty produced in the coil q is applied to a portion projected to the 1 side from the connecting part r e of the lens attachment component d, i.e., a lens attaching part holding moving lens c, When the lens attachment component d is moved, a moment arises in this, and there is a problem that a motion of the lens attachment component d becomes heavy, or an optic axis of moving lens c inclines with this moment.

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## MEANS

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(E. The means for solving a technical problem)

Then, in order that a lens barrel for this invention cameras may solve an aforementioned problem, It is made to support inside two proposals in which two insides of a proposal mutually located in an abbreviated opposite hand on both sides of an optic axis of a moving lens of a lens attachment component holding a moving lens were provided inside a coat, enabling free sliding, A coil and a magnet which constitute an actuator are fixed to a lens attachment component and a member by the side of a coat according to each so that it may be mutually arranged on the same axle at a circumference of an axis of the above-mentioned optic axis, A position detecting means for detecting a position of a lens attachment component from two insides of a proposal in the above-mentioned coat to a position as for which abbreviation regular intervals separated is established.

Therefore, if it is in a lens barrel for this invention cameras, A moving lens of space for arranging a moving lens and an actuator to which it is moved will set radially, and a size of a large grade will be [ \*\* and the surroundings ] sufficient for a required size from a diameter of the moving lens concerned, And since it distributes moderate and two insides of a proposal and position detecting means are arranged at a circumference of an axis of an optic axis of a moving lens, By these, can make quite small a size which can set a moving lens of a lens barrel radially, and. Even if there is an outside which does not have a partial lug, or such a lug, it can make it a small outside and is excellent in the design effect, And can consider it as user-friendly shape and further, Since a locomotive faculty produced to a coil or a magnet which is a move element of an actuator will be uniformly applied to the whole portion located so that a moving lens might be annularly surrounded among lens attachment components, When a lens attachment component is moved, a moment that the optic axis inclines to this cannot arise, therefore a lens attachment component can be smoothly moved along an optical axis direction of a moving lens.

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## EXAMPLE

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### (F. Example) [Drawings 1 thru/or 7]

Below, it explains according to an example illustrating details of a lens barrel for this invention cameras.

An illustrated example applies this invention to a lens barrel of a video camera.

#### (a. Outline) [Drawing 1, Drawing 2]

As for 1, the body part and 3 are lens barrels a video camera and 2, and this lens barrel 3 equips a cross direction with the coat 4 for which it has a long outside of an approximately prismatic form, and it is provided so that it may project toward the front from the front end surface of the body part 2. And inside the coat 4, the lenses 5a, 5b, 5c, 6a, 6b, 6c, 7a, 7b, 8a, 8b, 9, 10a, 10b, and 10c of a large number which have a predetermined optical control operation, respectively share one optic-axis x-x mutually, and are arranged in this order from before.

A zoom lens system is constituted by the lenses 5a, 5b, 5c, 6a, 6b, 6c, 7a, and 7b, the focus lens system is constituted by the lenses 8a, 8b, 9, 10a, 10b, and 10c of the complementary, and the lenses 6a, 6b, and 6c are the moving lenses for zooming.

The lens group 11 which comprises the three lenses 10a, 10b, and 10c by the side of the back end is what is called a master lens. This master lens 11 is a moving lens for focusing, and this master lens 11 is held at the lens attachment component 12 supported by the coat 4 enabling free movement to a cross direction, and. It is moved to a cross direction by the actuator 15 provided with the coil 13 and the magnet 14.

16 is a diaphragm blade.

Although the graphic display is omitted, the recording device etc. which change into an electrical machinery signal the optical image which the cassette mount and the tape running mechanism which the inside of the body part 2 is equipped with a tape cassette enabling free attachment and detachment, and said lens system caught, and carry out magnetic recording of it to the magnetic tape of a tape cassette are established.

#### (b. Support of a coat and a lens) [Drawings 1 thru/or 3]

As described above, the coat 4 of the lens barrel 3 has an outside of an approximately prismatic form,

and the space 17 which carried out the opening to coat 4 order both sides is formed in the inside. Sectional shape which intersects perpendicularly with optic-axis x-x this space 17 to the fixed lens cylinder 18 which succeeded in the shape of an approximately square and has been arranged in the shape of inner fitting in the front end part The lens 5a, To two fixed lens cylinders which 5b and 5c were held and have been arranged in the pars intermedia and which are not illustrated, the lens 7a, 7b and the lenses 8a and 8b are held according to each, and it is held in a front side [ which is supported like and mentions the lens 9 later further ] supporting base which the moving lenses 6a, 6b, and 6c for zooming can move to a guiding shaft which was fixed to the coat 4, and which is not illustrated freely to a cross direction.

(c. A supporting base) [Drawings 1, 3, or 6]

19 is a supporting base for supporting said lens attachment component 12, the actuator 15, various kinds of detection means to mention later, etc.

Project from the base 20 which carried out tabular [ of an approximately square ], and its rear face, the two same axle ringed walls 21 and 22, the two bearing parts 23 and 23, and the one detection member fitting part 24 of each other are formed in one with a synthetic resin, and the supporting base 19 changes, The inside ringed wall 21 is formed so that it may project toward back from a center section of the base 20, and the hole 21a is the light passing hole in which the front end carried out the opening to a front face of the base 20.

The lens 9 is arranged in this light passing hole 21a.

a diameter of the outside ringed wall 22 -- a length of one side of the base 20 -- \*\* -- it being small and, The two bearing parts 23 and 23 and detection member fitting parts 24 make tubed [ long ] a cross direction, respectively, Two corners where the bearing parts 23 and 23 were mutually located in an opposite hand across the light passing hole 21a among four corners of the base 20, Namely, it is formed so that it may see from the front and may project toward back from two corners, the upper right and the lower left, The detection member fitting part 24 is formed so that it may project toward back from an upper left corner, and the opening of the front end of the holes 23a and 23a of these bearing parts 23 and 23 and the hole 24a of the detection member fitting part 24 is carried out to a front face of the base 20.

25, 25, and ... are the bearing metal which carried out cylindrical shape, and press fit immobilization of these bearing metal 25 and 25 and ... is carried out to the holea [ 23 ] and 23a order both ends of the bearing parts 23 and 23.

22a is the attaching recess formed in a position of the detection member fitting part 24 and the abbreviated contrary on both sides of an axis of the light passing hole 21a among peripheral faces of the ringed wall 22.

26 is an intermediate wall (refer to the 1st figure) of the coat 4. It is located so that this intermediate wall 26 may be in a position of approximately middle in a cross direction of the coat 4 and space 17 may be made into order for abbreviated 2 minutes, and the base 20 of the supporting base 19 is

being fixed to a rear face of this intermediate wall 26 by fixing means, such as a screw clamp, for example.

26a is the light passing hole formed in an approximately center part of the intermediate wall 26. 26b and 26b are the holes formed so that it might be open for free passage to the holes 23a and 23a of the bearing parts 23 and 23 on a rear face of the intermediate wall 26.

(d. Posterior-wall-of-stomach board) [Drawing 1, Drawing 3, Drawing 4, Drawing 6]

27 is a posterior-wall-of-stomach board -- the base 20 of the supporting base 19 -- abbreviated -- it is formed so that it may succeed in tabular [ of the square which has the same size ], and the light passing hole 27a is formed in the center section.

And such a posterior-wall-of-stomach board 27 is arranged in the state with a predetermined interval between the supporting bases 19 at the rear end part of the space 17, and it is fixed by the fixing means which is not illustrated to the coat 4.

(e. Lens attachment component) [Drawing 1, Drawing 3, Drawing 4, Drawing 6]

The principal piece 28 to which, as for the lens attachment component 12, the surroundings made tabular [ of the small approximately square ] abbreviated \*\* from the posterior-wall-of-stomach board 27, It projects from the front face of this principal piece 28, and same axle lens attaching part 29 and coil bobbin 30, the two mounting bosses 31 and 31, and the two detection member fitting parts 32 and 33 of each other that also projected this from the front face of the principal piece 28 are formed in one with the synthetic resin.

The lens attaching part 29 and the coil bobbin 30 are carrying out approximate circle tubed with short shaft-orientations length considering the size of a diameter, respectively, The lens attaching part 29 is formed so that it may project toward the front from the center section of the principal piece 28, the hole 29a is the light passing hole in which the rear face carried out the opening to the rear face of the principal piece 28, and the master lens 11 is held at such a lens attaching part 29.

And the mounting bosses 31 and 31 are arranged according to each in a corner at the upper right of the principal piece 28, and a lower left corner, and a rear end part of the sliding shafts 34 and 34 is being fixed in the shape of burial. Therefore, the driving shafts 34 and 34 are projected in parallel toward the front from a corner of the lens attachment component 12 mutually located in an opposite hand. And such sliding shafts 34 and 34 are inserted in the bearing metal 25 and 25 supported by the bearing parts 23 and 23 of said supporting base 19, the holes 25a and 25a of ..., and ..., enabling free sliding.

carrying out a deer -- the lens attachment component 12 -- the supporting base 19 and the posterior-wall-of-stomach board 27 -- it can do and can move in the direction parallel to optic-axis x-x freely -- it is supported like.

The two detection member fitting parts 32 and 33 are arranged according to each in two corners the lower right and at the upper left of the principal piece 28.

(f. Actuator) [Drawings 1, 3, or 6]

Said actuator 15 comprises the magnet 14 supported by the yoke body 35 supported by the

supporting base 19 and this yoke body 35 and the coil 13 supported by the lens attachment component 12.

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The lens attaching part 29 and the coil bobbin 30 are carrying out approximate circle tubed with short shaft-orientations length considering the size of a diameter, respectively, The lens attaching part 29 is formed so that it may project toward the front from the center section of the principal piece 28, the hole 29a is the light passing hole in which the rear face carried out the opening to the rear face of the principal piece 28, and the master lens 11 is held at such a lens attaching part 29.

And the mounting bosses 31 and 31 are arranged according to each in a corner at the upper right of the principal piece 28, and a lower left corner, and a rear end part of the sliding shafts 34 and 34 is being fixed in the shape of burial. Therefore, the driving shafts 34 and 34 are projected in parallel toward the front from a corner of the lens attachment component 12 mutually located in an opposite hand. And such sliding shafts 34 and 34 are inserted in the bearing metal 25 and 25 supported by the bearing parts 23 and 23 of said supporting base 19, the holes 25a and 25a of ..., and ..., enabling free sliding.

carrying out a deer -- the lens attachment component 12 -- the supporting base 19 and the posterior-wall-of-stomach board 27 -- it can do and can move in the direction parallel to optic-axis x-x freely -- it is supported like.

The two detection member fitting parts 32 and 33 are arranged according to each in two corners the lower right and at the upper left of the principal piece 28.

(f. Actuator) [Drawings 1, 3, or 6]

Said actuator 15 comprises the magnet 14 supported by the yoke body 35 supported by the

supporting base 19 and this yoke body 35 and the coil 13 supported by the lens attachment component 12.

The inner yoke 35b which carried out cylindrical shape projected towards back from the inner periphery edge of the middle yoke 35a which carried out approximately ring shape, and this middle yoke 35a, and the outer yoke 35c projected towards back from the outer periphery part of the middle yoke 35a the yoke body 35 with the good metallic material of permeability. It is formed in one, and changes and the abbreviated first portion is being fixed to the base 20 in the state where it was located between the two ringed walls 21 and 22 of the supporting base 19.

The magnet 14 is formed so that it may succeed in short cylindrical shape to shaft orientations, and it is magnetized so that magnetic poles may differ towards intersecting perpendicularly with the axis, and it is being fixed to the outer yoke 35c in the shape of inner fitting.

And the coil 13 is wound around the first portion of the peripheral face of the coil bobbin 30 of the lens attachment component 12, and is located in the state with \*\*\*\*\* to these between the inner yoke 35b and the magnet 14.

The closed magnetic circuit which carries out a deer and along which the magnetic flux which came out of the magnet 14 passes by the magnet 14 and the yoke body 35, That is, the closed magnetic circuit along which the above-mentioned magnetic flux passes by the course of the magnet 14-outer yoke 35c-middle yoke 35a-inner yoke 35b-magnet 14, for example is formed, and the coil 13 is located on such a closed magnetic circuit.

Therefore, since the magnetic flux from the coil 13 to the direction according to the direction of that driving current will occur if driving current is supplied to the coil 13, thereby, the locomotive faculty to the front or back is energized by the coil 13, and the lens attachment component 12 is moved in one with the master lens 11 by this locomotive faculty.

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#### DESCRIPTION OF DRAWINGS

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##### [Brief Description of the Drawings]

Drawing 1 thru/or 7 are what shows an example of the operation which applied the lens barrel for this invention cameras to the lens barrel of the video camera, The sectional view where there is Drawing 1 along central drawing of longitudinal section, Drawing 2 meets the perspective view of a video camera, and Drawing 3 meets the III-III line of Drawing 1, The exploded perspective view of the important section which the sectional view and Drawing 5 where Drawing 4 meets the IV-IV line of Drawing 3 turn off a part of supporting base, yoke, and magnet, and is lacked and shown, the exploded perspective view of an important section in which Drawing 6 shows a posterior-wall-of-stomach board and a lens attachment component, the expanded sectional view of an important section in which Drawing 7 shows the modification of a position detecting means, and Drawing 8 show an example of the conventional lens barrel for cameras -- it is a notch side view in part.

##### Explanations of letters or numerals

- 3 .... Lens barrel for cameras,
- 4 .... A coat, 11 .... Moving lens
- 12 .... Lens attachment component,
- 13 .... A coil, 14 .... Magnet,
- 15 .... Actuator,
- 19 .... Member by the side of a coat,
- 23 .... The inside of a proposal, 34 .... Inside of a proposal,
- 36 .... Position detecting means,
- x-x .... Optic axis,
- 36A .... A position detecting means, 39 .... Speed detection means

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[Translation done.]

\* NOTICES \*

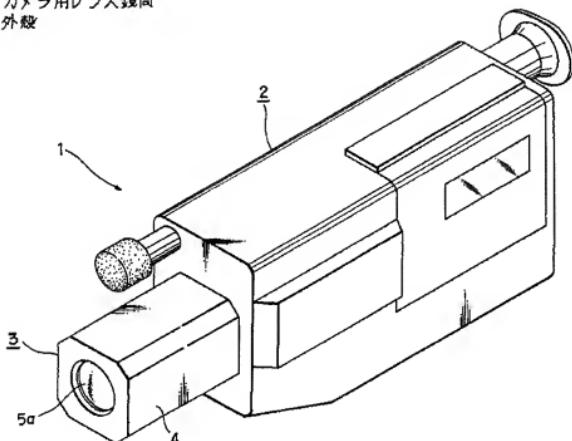
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DRAWINGS

[Drawing 2]

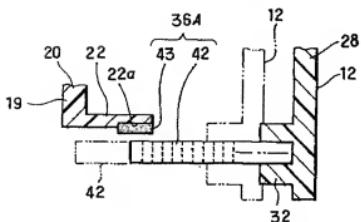
3 … カメラ用レンズ鏡筒  
4 … 外殻



斜 視 図

[Drawing 7]

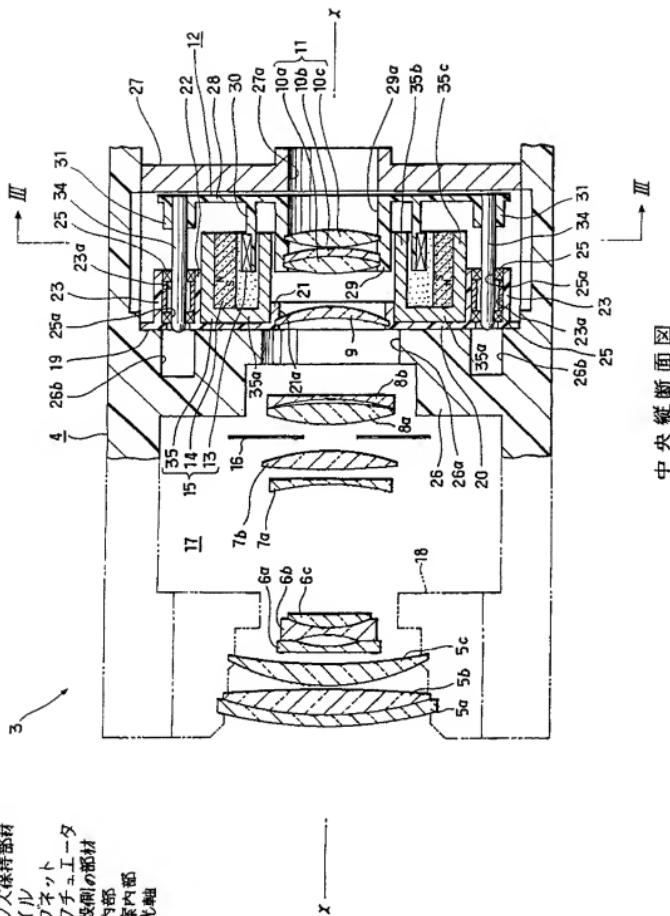
12 … レンズ保持部材  
19 … 外殻側の部材  
364 … 位置検出手段



要部の拡大断面図（変形例）

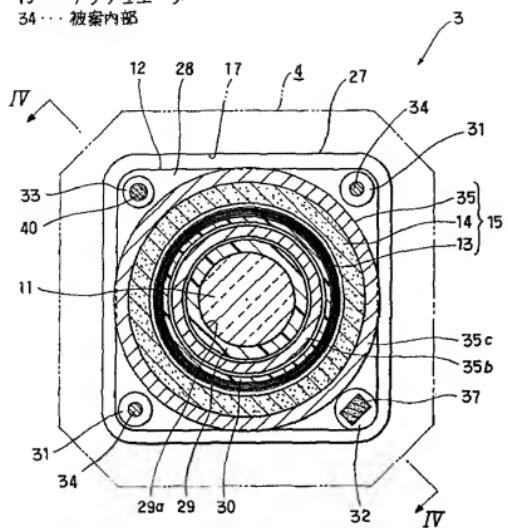
[Drawing 1]

3 ……カメラ用レンズ鏡筒  
 4 ……外蓋  
 11 ……可動レンズ  
 12 ……レンズ保持部材  
 13 ……コイル  
 14 ……マグネット  
 15 ……マグチューダ  
 19 ……外筒側の部材  
 23 ……案内部  
 34 ……筒蓋内部  
 X-X ……光軸



[Drawing 3]

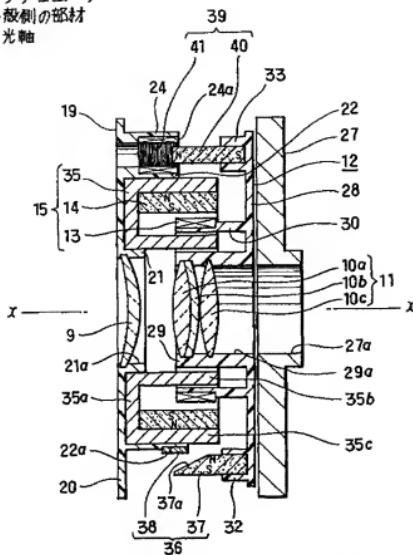
3 カメラ用レンズ<sup>鏡筒</sup>  
 4 外殻  
 11 可動レンズ  
 12 レンズ保持部材  
 13 ゴイル  
 14 マグネット  
 15 アクチュエータ  
 34 被素内部



### 断面図(III-III線)

[Drawing 4]

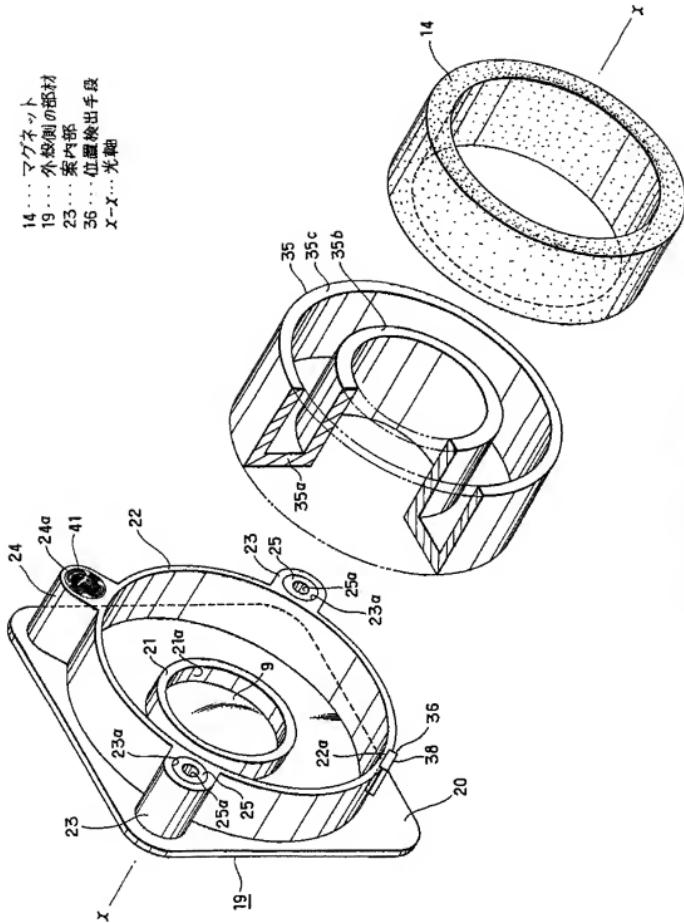
11 ……可動レンズ  
 12 ……レンズ保持部材  
 13 ……コイル  
 14 ……マグネット  
 15 ……アクチュエータ  
 19 ……外殻側の部材  
 X-X ……光軸



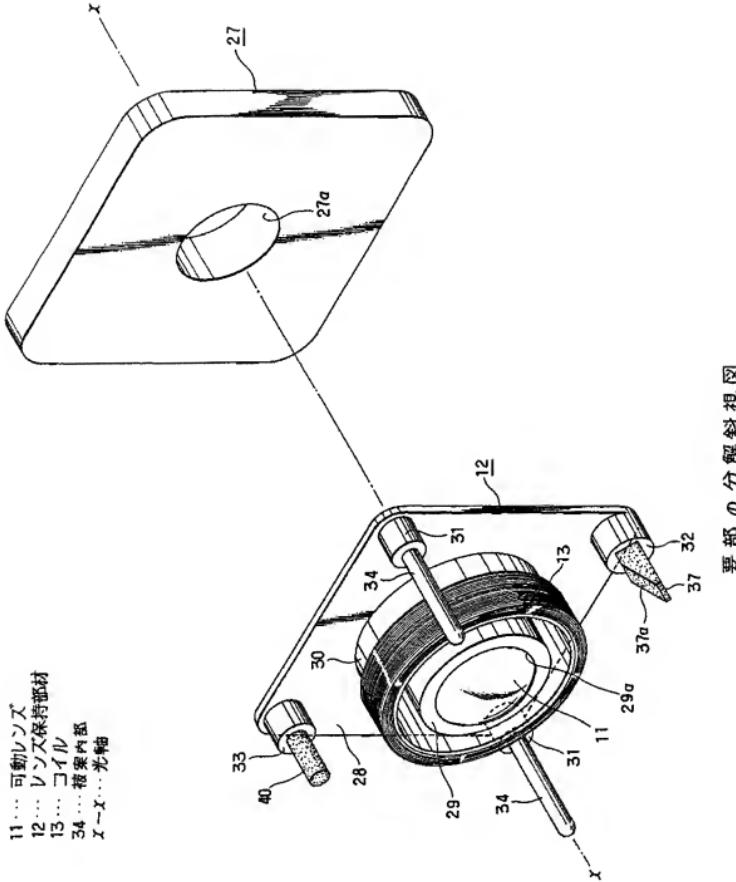
断面図 ( IV-IV 線 )

[Drawing 5]

一部切次要部の分解斜視図

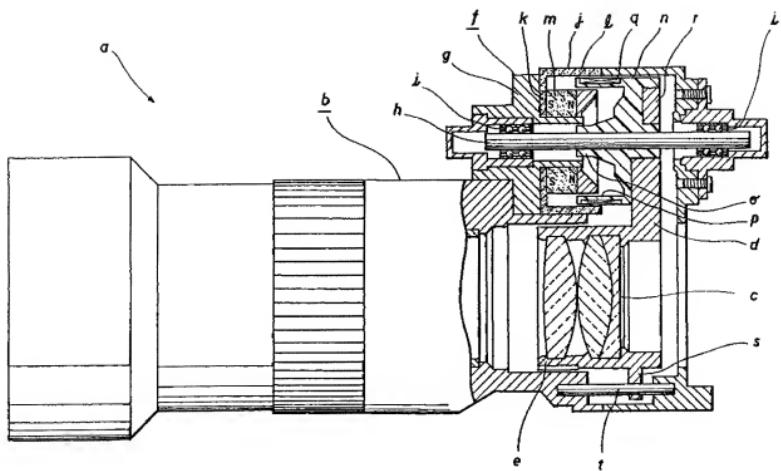


[Drawing 6]



要部の分解斜視図

[Drawing 8]



一部切欠側面図（従来例）

[Translation done.]